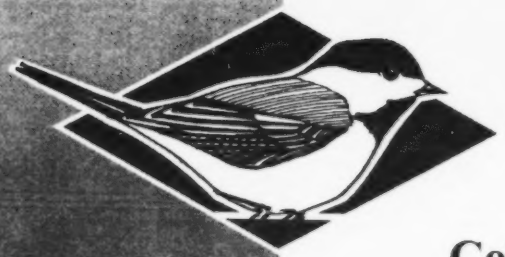

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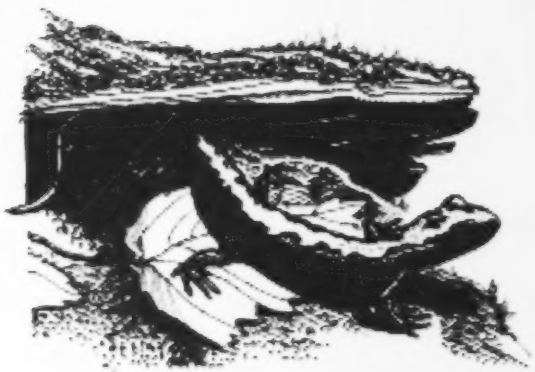

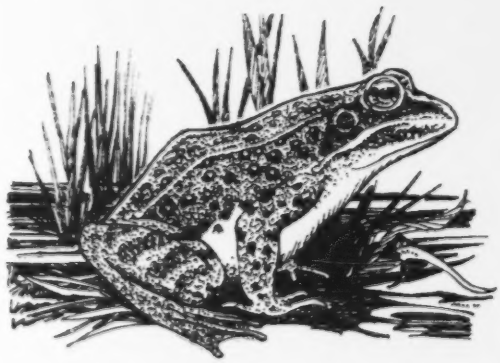

Alberta Species at Risk Report No. 39

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

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Dale Paton

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Executive Summary

An amphibian survey of breeding habitat in the montane and subalpine subregions of the Oldman, Crowsnest and Castle River drainages was carried out in 2001. The survey was designed to collect information on occurrence of breeding ponds for long-toed salamander and Columbia spotted frog, and also provided information on western toad and tiger salamander.

This project included a re-survey of 24 sites done in 1995 plus selection and inventory of 45 new sites. Of the 24 original sites, the 2001 surveys showed 9 to contain long-toed salamander, 6 with Columbia spotted frog, 4 with western toad, and 1 pond had tiger salamander. There was a reduction in the number of sites with long-toed salamander from 1995 to 2001. Amphibians were confirmed at 30 of the 45 new sites. Seventeen of the sites had long-toed salamander, 11 had Columbia spotted frog, 9 had western toad, and 1 had tiger salamander. Twelve of the combined total of 69 sites supported more than one species of amphibian.

Threats to subalpine and montane amphibian populations were identified. They included fish stocking, loss of wetlands, degradation and loss of terrestrial habitat, and ATV use in breeding ponds.

Project recommendations include long-term monitoring with a repeat of this survey in 5 years, establishment of a RANA site in the Castle drainage, maintenance of buffers around breeding ponds, rerouting of ATV trails, and research on long-toed salamanders in fish bearing vs. non-fish-bearing ponds.

1.0 Introduction

Global declines in amphibian populations have increased the need for scientific data on the distribution, population sizes and trends of amphibian species. This, combined with a growing interest in the biological diversity of ecosystems, has resulted in managers monitoring a wide range of taxa, including amphibians, when trying to determine the effects of multiple–use management (DeMaynadier and Hunter 1995). Amphibian populations are potential indicators for monitoring ecosystem disturbance (Vitt et al. 1990, Dunson et al. 1992, Pechman and Wilbur 1994). Very little long-term amphibian population data exists for southwestern Alberta making it difficult to quantify changes in amphibian numbers. The Alberta Fish and Wildlife Division has established the Species at Risk Program to investigate the status of a variety of sensitive species and implement management to sustain their populations and habitat. This report represents an amphibian survey of the mountains and foothills of southwestern Alberta funded by the Species at Risk Program.

In Alberta's montane, subalpine and alpine ecoregions, there are three amphibian species classified as "sensitive", the long-toed salamander (*Ambystoma macrodactylum*), Columbia spotted frog (*Rana luteiventris)*, and western toad (*Bufo boreas*) (Alberta Fish and Wildlife 2000)

Surveys of long – toed salamanders have provided information on their distribution (Holroyd and Van Tighem 1983, Oseen et al 1995 , Nelson et al. 1995, Pearson 2000). Research has provided insights into salamander ecology (Powell et al. 1993, Graham 1997, Thompson and Russell 2001). The Columbia spotted frog and western toad have not been extensively surveyed in Alberta. The purpose of this project was to gather more information on these three species at historic sites as well as to search for them in other suitable habitats.

2.0 Survey Area and Objectives

The survey area was bounded on the west by the Alberta/British Columbia border, on the south by the United States/Canada border, on the east by Highway 6 and Highway 22, and on the north by the Kananaskis Country boundary. One additional site outside the boundaries was located near Stavely. Nelson et al (1995) surveyed nine "regions" for long – toed salamanders. The three "regions" within the Oldman River Basin that were re-surveyed in this project included the Forestry Trunk Road, Crowsnest Pass, and Castle River drainage.

The Forestry Trunk Road survey extended north of Coleman up Hwy. #940, then east along secondary Hwy. #532 (Johnson Creek trail), then north on Hwy 22 to Longview. The Crowsnest Pass survey encompassed the Municipality of the Crowsnest Pass and east to Hwy 507. The Castle River survey consisted of the South and West Castle River valleys, the Screwdriver Creek area and the Carbondale River drainage.

The objectives of these surveys were to:

- Complete surveys for long – toed salamanders and Columbia spotted frogs, in the subalpine and montane regions of southwestern Alberta;
- Survey historic amphibian sites;
- Identify additional potential amphibian sites and survey them;
- Identify sites for the possible future establishment of a long term RANA ("Researching Amphibian Numbers in Alberta" Project) monitoring site in southwestern Alberta.

3.0 Methods

Present/not detected field surveys were conducted over a 3.5 month time period (April 15 – July 30). Searching for egg masses in the spring was considered the most appropriate and efficient method of identifying breeding areas and the presence of amphibian species (Nelson et al. 1995).

One of the objectives of this inventory was to re-survey the 24 sites found in the Oldman River Basin, which were completed by Nelson et al. (1995). Survey effort was directed toward previously documented breeding areas, searching large and small water bodies for salamander, frog and toad eggs. Additional sites were chosen by reviewing aerial photos for likely breeding ponds, reviewing District Fish and Wildlife files, questioning local residents about historic sites and searching provincial BSOD records. For ease of comparison the name and site numbers used by Nelson et al. (1995) were used to describe the same sites in 2001 surveys.

At each site a standard set of information was collected:

- LOCATION – described general location of site, with GPS Lat./Long coordinates;
- DESCRIPTION – defined the size and type of waterbody;
- WATER – described general characteristics of the water such as inlet and outlet sources, unusual features, turbidity and rate of flow;
- VEGETATION – described plant life in and adjacent to the water body;
- POPULATION – documented the number of eggs, larvae or adults observed.

Detailed site descriptions for the 24 surveyed sites identified by Oseen et al (1995) and Nelson et al. (1995) are found in their reports. If changes in site characteristics were found they were noted.

Surveys were conducted during daylight hours between 0800h and 1900h. Many amphibian surveys are not conducted during the day, but for the survey technique of counting eggs and egg masses, it was necessary. Weather conditions during the survey time period were variable, with snow, rain, and sunshine. The spring temperatures were cooler than average, possibly delaying the timing of laying eggs by 2 or 3 weeks. The same breeding delay was noted in nearby Waterton National Park (Kim Pearson pers. com.). In order to determine time of egg laying reconnaissance surveys were undertaken every two days until the first eggs were observed on May 16.

To conduct the surveys an observer walked around the complete perimeter of the smaller water bodies. Smaller water bodies were defined as breeding ponds that could be completely surveyed in 30 minutes and had a shoreline perimeter of less than 70m. At larger ponds three randomly selected 10 meter transects were established along the periphery of the pond as outlined in the methodology by Rice (2000). Eggs within 2m of the shore were counted individually, or if they were numerous, estimates were used. The use of polarized glasses helped to reduce the glare from reflected sunlight on the water.

4.0 Results

The 1995 surveys had confirmed 18 long–toed salamander breeding locations from a survey of 24 sites in the Castle, Crowsnest Pass, and Forestry Trunk Road "regions"(Nelson et al 1995.). Surveys conducted in 2001 of the same 24 sites found only 9 to be breeding sites for long–toed

salamanders. The ten original sites of LTSA that were located in 1995 (Nelson et al.) were resurveyed in July 2001 to determine if larvae were present, even though eggs had not been observed in May 2001. No larvae were observed in any of these ten sites suggesting that breeding likely did not occur in these ponds in 2001. In 1995, at the 24 sites, there were 5 sites with Columbia spotted frog eggs and 6 sites with western toad egg masses (Table 1). The 2001 survey of the same sites produced 6 sites with Columbia spotted frog and 4 sites with western toad egg masses. One site near Bellevue was found to have thirty-five tiger salamander larvae and one adult long-toed salamander (Table 1).

Table 1: Amphibian sites surveyed by both Nelson et al. (1995) and Paton (2001)

		1995	2001	1995	2001	1995	2001	1995	2001
Site #	Site name	LTSA	LTSA	SPFR	SPFR	WETO	WETO	TISA	TISA
Stavely									
44	Stavely								
Forestry Trunk Road									
45	Livingstone Gap	P	W		W				
46	Vicary	P	P		P	P	P		
47	Grassy	P	P		P				
48	Coleman	P	D		D		D		D
Crowsnest Pass									
Site #	Site name		LTSA		SPFR		WETO		TISA
49	Bellevue		P						P
50A	Frank	P	P						
50B	Frank	P							
51	Hall Pond	P							
Castle Drainage									
Site #	Site name		LTSA		SPFR		WETO		TISA
52	Screwdriver Ck.			P	P				
53	Beaver Creek	P							
54(2a)	Mount Bakus	P	P						
55	Mount Bakus	P							
56	Castle Wetland	P		P	P				
57	Beaver Lake Road	P	P	P		P	P		
58	Beaver Lake Road	P		P	P	P			
59	Castle River Falls	P	D		D		D		D
60	West Castle Road	P				P			
61	West Castle Backwater								
62	West Castle River North	P	P						
63	West Castle River Middle	P	P	P	P	P	P		
64	West Castle River South								
65	Rainy Ridge Lake								
66	South Castle River	P	P			P	P		
	Totals	18	9	5	6	6	4		1

P - amphibian breeding evidence was present.
D – site was devoid of water
W – site was washed out by a flood

In addition to the re-survey of the 1995 sites, a total of 45 new sites were inspected in 2001. Amphibians were detected at 30 of the sites. Seventeen of the sites had long-toed salamander, 11 had Columbia spotted frog, 9 sites had western toad and 1site had tiger salamander. (Table 2). All of the survey sites were located in the montane and subalpine ecoregions. The tiger salamander site was located in the montane ecoregion.

Table 2: Amphibians observed during surveys of new sites in the Oldman River Basin

Site #	Site name	LTSA	SPFR	WETO	TISA
1	Tent Mountain Bridge	1			
2	Old Hwy 3 (a)		1		
3	Everett pond	1			
4	Syncline Staging	1	1		
5	Chinook Lake			1	
6	Sekella Pond		1		
7	Beaver Lake Turnoff	1			
8	Kerr Dugout		1	1	
9	Coseka			1	
10	Racehorse Beaver Ponds	1	1		
11	Limeworks Lake	1			
12	Goat Creek	1			
13	O'hagan Cutline Puddle		1		
14	South Goat Wetlands	1	1		
15	North Lost Creek	1			
16	Blairmore Sawmill	1	1	1	
17	Hayes Pond			1	
18	Trapper Cabin Puddle	1			
19	Tecumseh Guest Ranch	1			
20	Deadman Pass		1	1	
21	Coleman Fish and Game Pond		1		
22	MacGillivary Creek	1			
23	Lane Dugout				1
24	Gold Creek/Cauldron	1			
25	Lee Lake			1	
26	Antil Pond			1	
27	North Goat Creek Pond	1			
28	South Goat Puddle	1			
29	Beaver Lake Junction	1			
30	Oldman Site		1	1	
	Totals	17	11	9	1

Twelve of the combined total of 69 sites contained more than 1 species of amphibian. In the 1995 survey, 7 of the 24 sites surveyed had more than 1 species while in 2001 surveys of the same sites 5 had more than one species (Table 1). Maps of the locations of observations are included (Figures 1-4).

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Forestry Trunk Road									
45	Livingstone Gap	P	W		W				
46	Vicary	P	P		P	P	P		
47	Grassy	P	P		P				
48	Coleman	P	D		D		D		D
Crowsnest Pass									
Site #	Site name		LTSA		SPFR		WETO		TISA
49	Bellevue		P						P
50A	Frank	P	P						
50B	Frank	P							
51	Hall Pond	P							
Castle Drainage									
Site #	Site name		LTSA		SPFR		WETO		TISA
52	Screwdriver Ck.			P	P				
53	Beaver Creek	P							
54(2a)	Mount Bakus	P	P						
55	Mount Bakus	P							
56	Castle Wetland	P		P	P				
57	Beaver Lake Road	P	P	P		P	P		
58	Beaver Lake Road	P		P	P	P			
59	Castle River Falls	P	D		D		D		D
60	West Castle Road	P				P			
61	West Castle Backwater								
62	West Castle River North	P	P						
63	West Castle River Middle	P	P	P	P	P	P		
64	West Castle River South								
65	Rainy Ridge Lake								
66	South Castle River	P	P			P	P		
	Totals	18	9	5	6	6	4		1

P - amphibian breeding evidence was present.
D – site was devoid of water
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4	Syncline Staging	1	1		
5	Chinook Lake			1	
6	Sekella Pond		1		
7	Beaver Lake Turnoff	1			
8	Kerr Dugout		1	1	
9	Coseka			1	
10	Racehorse Beaver Ponds	1	1		
11	Limeworks Lake	1			
12	Goat Creek	1			
13	O'hagan Cutline Puddle		1		
14	South Goat Wetlands	1	1		
15	North Lost Creek	1			
16	Blairmore Sawmill	1	1	1	
17	Hayes Pond			1	
18	Trapper Cabin Puddle	1			
19	Tecumseh Guest Ranch	1			
20	Deadman Pass		1	1	
21	Coleman Fish and Game Pond		1		
22	MacGillivary Creek	1			
23	Lane Dugout				1
24	Gold Creek/Cauldron	1			
25	Lee Lake			1	
26	Antil Pond			1	
27	North Goat Creek Pond	1			
28	South Goat Puddle	1			
29	Beaver Lake Junction	1			
30	Oldman Site		1	1	
	Totals	17	11	9	1

Twelve of the combined total of 69 sites contained more than 1 species of amphibian. In the 1995 survey, 7 of the 24 sites surveyed had more than 1 species while in 2001 surveys of the same sites 5 had more than one species (Table 1). Maps of the locations of observations are included (Figures 1-4).

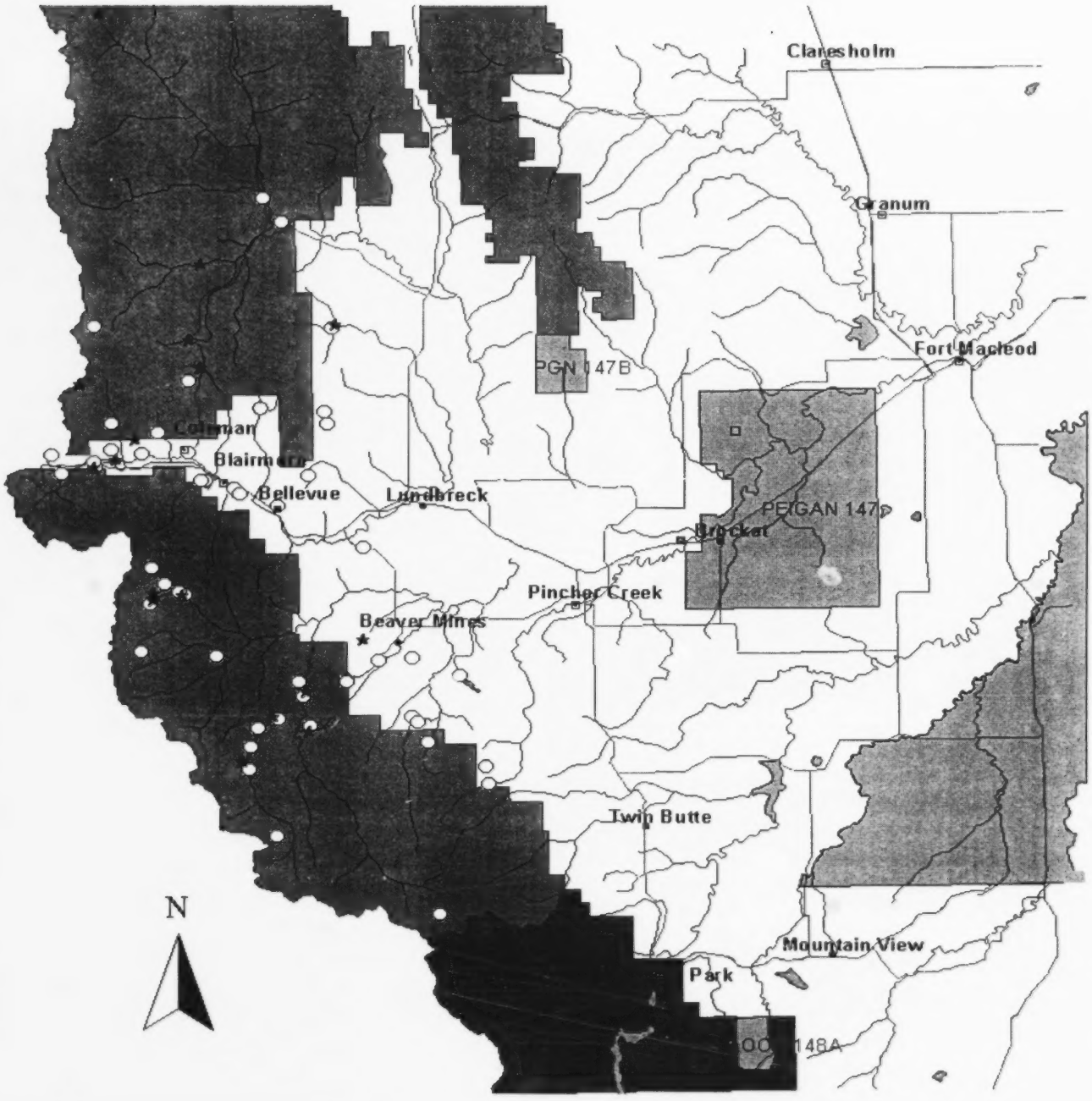
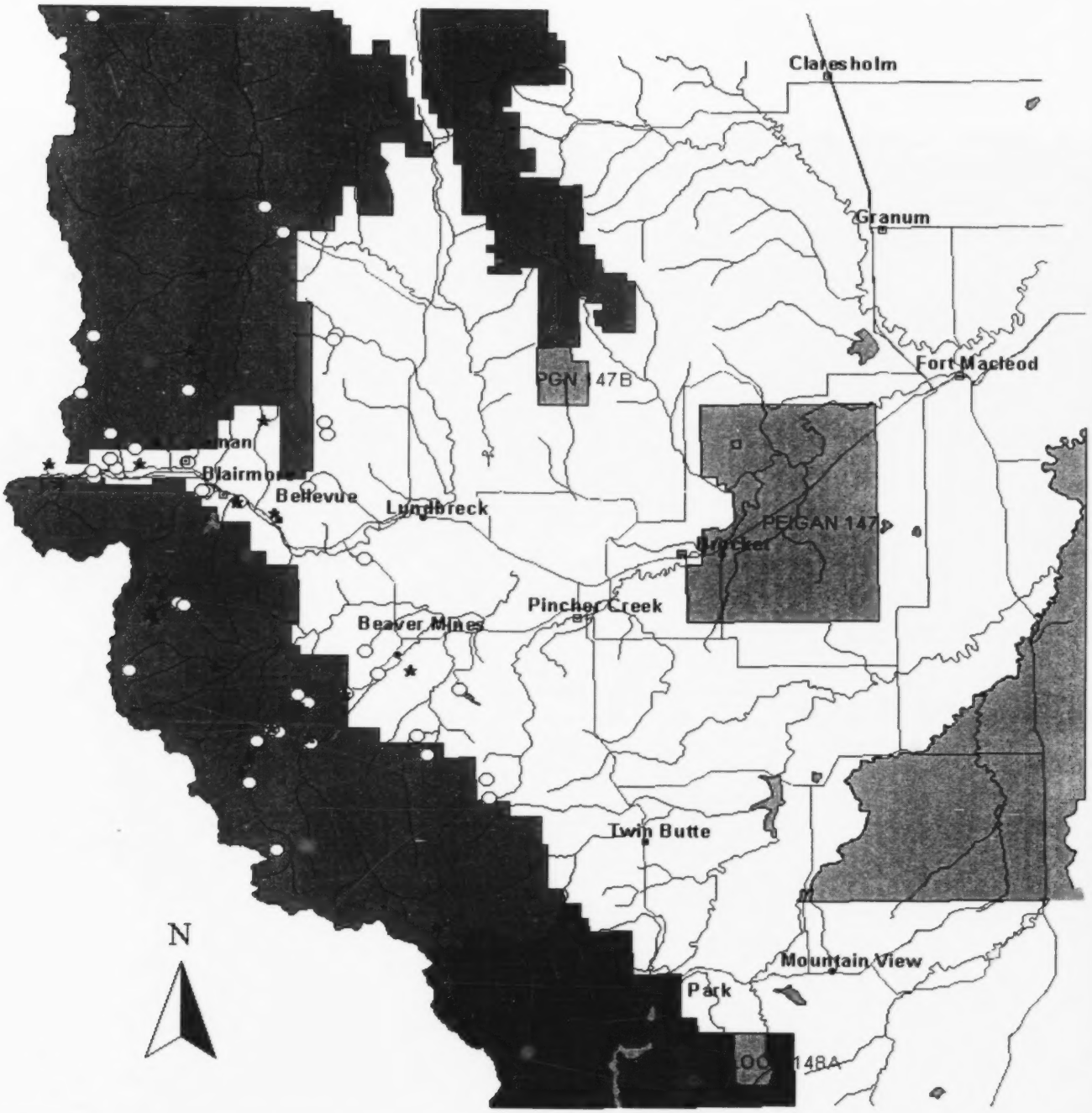


Figure 1: Columbia spotted frog sites within survey area



Long-toed Salamander Sites

- Not Detected
- LTSA Present
- Primary Roads
- Secondary Roads
- Lakes
- Rivers
- National Parks
- Indian Reserves
- Rocky Mountain Forest Reserve

Scale: Approx. 1:500,000

Figure 2: Long-toed salamander sites within survey area

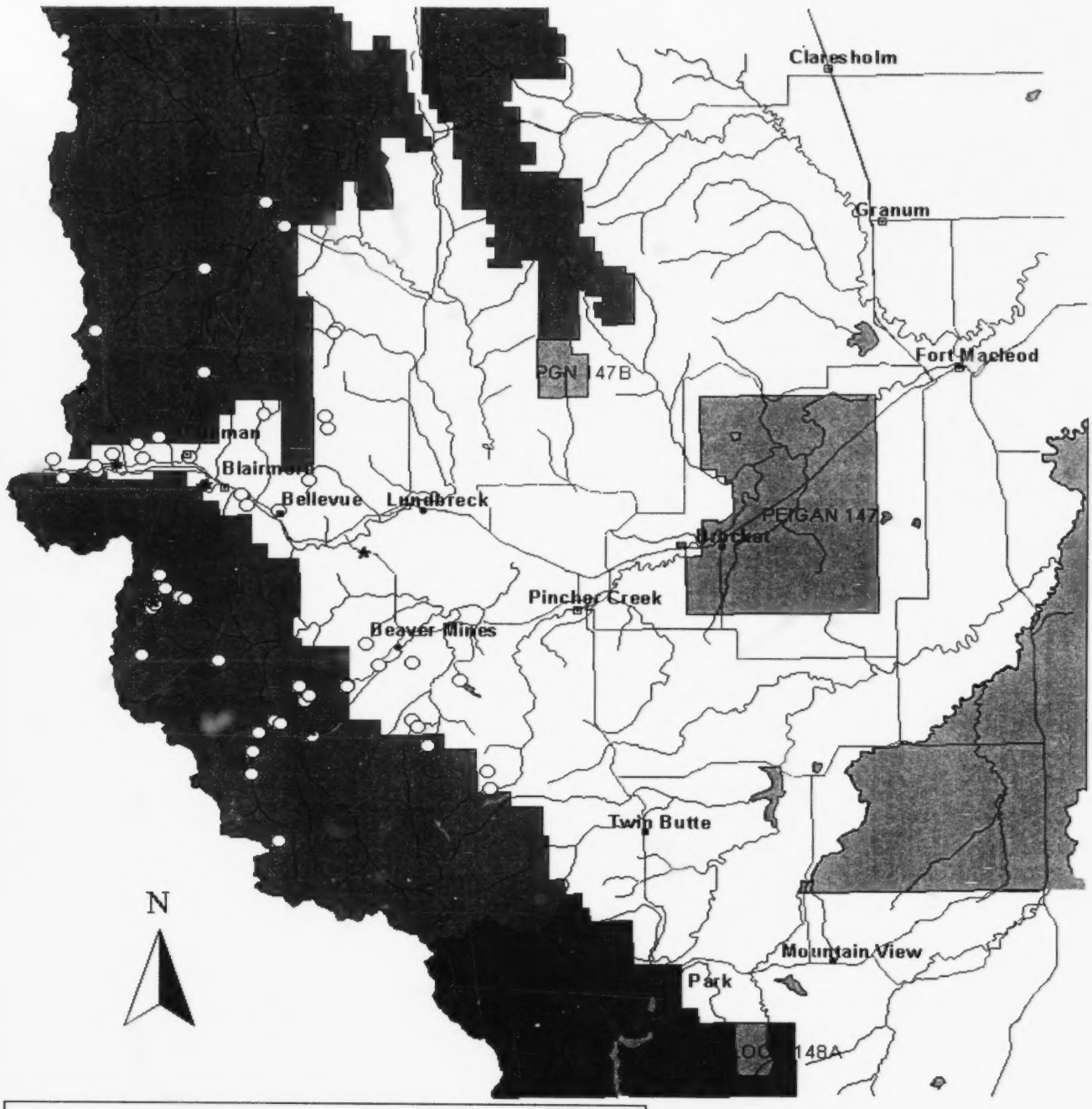
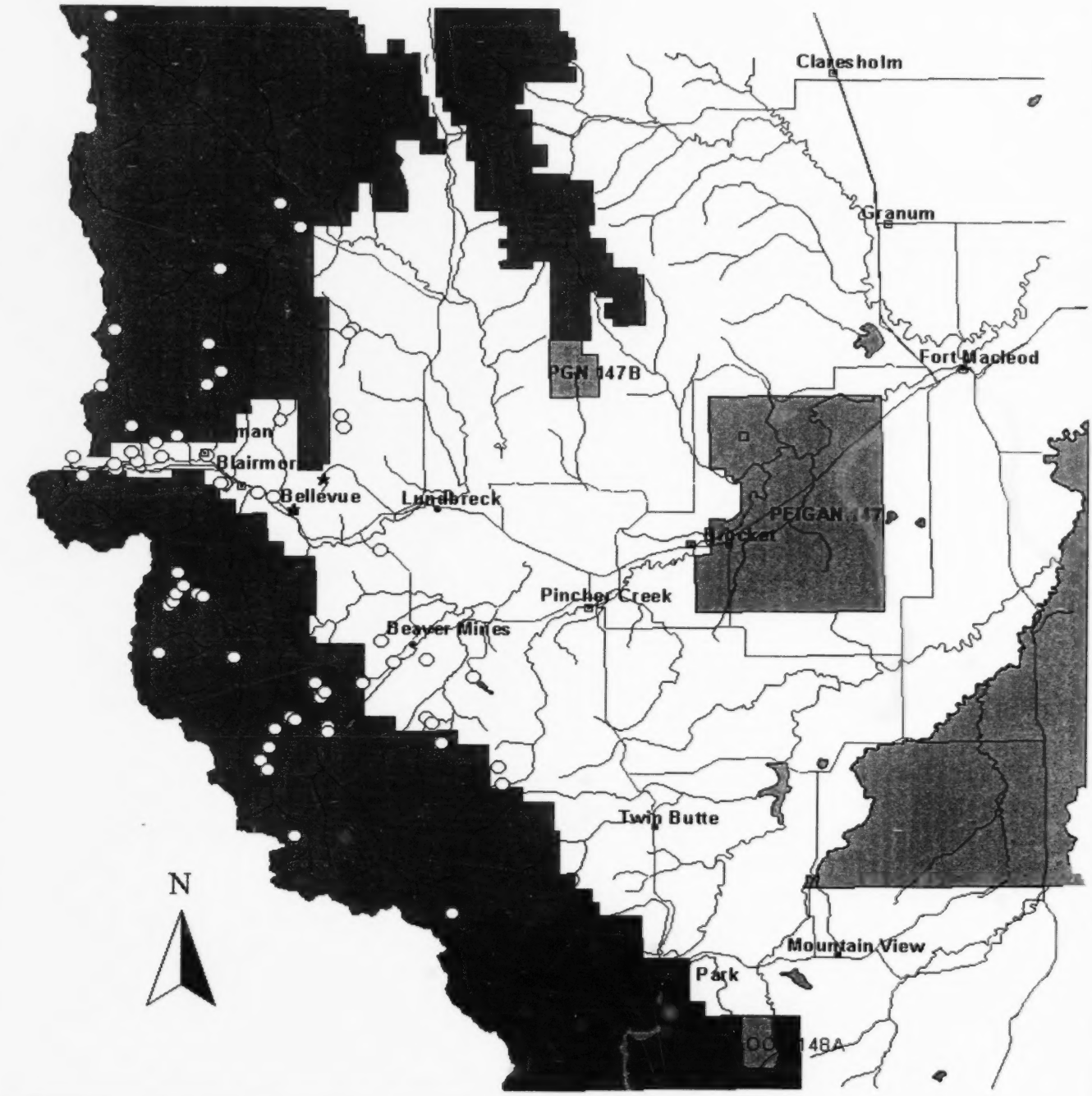


Figure 3: Western toad sites within survey area



Tiger Salamander Sites

Not Detected	Rivers
TISA Present	National Parks
Primary Roads	Indian Reserves
Secondary Roads	Rocky Mountain Forest Reserve
Lakes	

Scale 1:500,000

Figure 4: Tiger salamander sites within survey area

The first long-toed salamander egg masses were observed on May 16, 2001 at the Vicary Creek 940 (site #47), which is at an elevation of 1674m. Lower elevation sites that were monitored on a two-day survey cycle (sites 46, 51,57, 50a, 50b and 49) did not contain egg masses until May 18 even though ice had been completely off these sites for 11 days. Site 47 was half covered with ice when egg laying initiated. The life stage events observed (Table 3) are consistent with the time lines of the phenology tables (Table 4) presented in Rice (2000).

Table 3: Phenology Table for Crowsnest Pass Long-toed Salamander Populations (2001)

Life Stage	April	May	June	July	August	September
Egg Masses		16	17			
Larvae			12			22
Mature adults (aquatic habitat)						
Mature adults (terrestrial habitat)						

Table 4: Phenology Table for Waterton and Area Long-toed Salamander Populations (Rice 2000)

Life Stage	April	May	June	July	August	September
Egg Masses	14		24			
Larvae	1					15
Mature adults (aquatic habitat)		13				
Mature adults (terrestrial habitat)			21		31	

Columbia spotted Frog egg masses were first observed on May 16 at the Vicary 940 (site 46) and Grassy Mountain sites (site 47). Four 3cm X 4cm egg mass were found in water 25cm deep at the Vicary 940 site and one mass 5 X 4 cm at the Grassy Mountain site. One Columbia spotted frog was observed laying eggs near a group of 3 egg masses at 1735hrs on May 16 at site 46. On May 21 the eggs had hatched at Grassy Mountain pond, with the hatchlings observed swimming on top of the remaining egg mass. By May 28 all known spotted frog egg masses had hatched.

Columbia spotted frogs had been located in 5 of the 24 sites during the 1995 surveys. The 2001 inventory of these same sites confirmed 6 with Columbia spotted frogs. Eleven of the 45 new sites had egg masses spawn by Columbia Spotted Frogs.

5.0 Discussion

Reduction in the number of long-toed salamander breeding sites between 1995 and 2001 may have occurred for a number of reasons. These may include changing environmental conditions, habitat destruction and alteration, and global climate change. It is beyond the scope of this project to determine exactly why there was a reduction in the number of confirmed breeding sites. Drought conditions have occurred in the study area for several years. This has resulted in the drying up of 2 ponds identified in the Nelson et al. (1995) report. One site was lost due to flood conditions in late spring of 1995. It is also known amphibian breeding populations naturally undergo wide fluctuations in populations making them very sensitive to unpredictable

or stochastic events, such as changes in weather, food supply, populations of predators, competitors and parasites (Pechmann et al. 1994, Meffe et al. 1997). In many instances, a number of factors may be working together to cause a decrease in the viability of a population (Semlitsch 2000). It is best to formulate statements about amphibian population change from long-term data.

The surveys of 45 new potential sites resulted in 17 sites with long-toed salamander present. The water bodies supporting these populations varied in size from 2 X 3m to 40 X 150m. Long-toed salamander were observed more frequently in small ponds or puddles than in the larger ponds or lakes. The detection of egg masses was easier in the smaller water bodies because emergent vegetation usually was not as extensive or as dense. As transects were used to sample large water bodies, presence of a small breeding area could have been missed.

Tiger salamanders were found in Bellevue and along the North Burmis Road, indicating there is a degree of sympatric range overlap with long–toed salamanders in the Crowsnest Pass region

The population size and trend of the Columbia spotted frog in Alberta is uncertain (James 1998). Williams (1994) noted this was the least observed amphibian in Peter Lougheed Provincial Park. It was found in only 12% of the 74 wetlands surveyed, with breeding populations occurring in only 2 of the sites. Breeding populations of Columbia spotted frogs were found in 17 of the 69 sites surveyed in the Oldman River Basin during 2001. James (1998) noted there was an increase in the number of Columbia spotted frog sightings in the Waterton/Crowsnest Pass area in the 1990s, possibly related to an increase in the number of surveys and awareness in the area.

6.0 Threats to Amphibian Populations

6.1 Fish Stocking

The stocking of lakes with fish may have a negative impact on amphibian populations as the fish are both competitors and predators of amphibian larvae (Bradford 1989, Bradford and Graber 1993, Tyler et al. 1998, Funk and Dunlap 2000). It is recognized that long-toed salamanders coexist with game fish in some habitats, but habitat and other conditions required to allow this are not clearly understood (Liss et al. 1995, Tyler 1998).

6.2 Loss of Small Wetlands

Wetlands are very limited within the study area and represent critical habitat for significant amphibian populations. Many of the most productive water bodies in terms of the number of clutches or eggs spawn during this survey occurred in ephemeral ponds. Seasonal or temporary wetlands (<.4ha) can support a variety of amphibian species, produce numerous metamorphosing juveniles, and provide refugia for recolonization and dispersal from one breeding area to another (Semlitsch and Bodie 1998). These sites can provide breeding habitat for a variety of amphibians depending on the length of time they contain water. Small seasonal pools and temporary ponds are the most numerous types of wetlands and their loss could reduce a source population or restrict dispersal (Gibbs 1993). Seasonal pools can produce more metamorphs for recruitment than permanent ponds (Perchmann et al. 1989, Semlitsch 2000). Thus, failure to maintain small wetlands may result in the loss of very productive breeding habitat.

6.3 Degradation or Loss of Terrestrial Habitat

An often-overlooked aspect of the life history of amphibians is the maintenance of terrestrial habitat. Many amphibians do not move more than 200 – 300m to a breeding pond (Sheppard 1977, Gibbs 2000, Semlitsch 2000). The terrestrial habitat between ponds is critical for successful survival and dispersal and it is important to provide movement corridors or buffer zones of natural vegetation around pools or between pools to help maintain amphibians (Semlitsch 1998).

6.4 All Terrain Vehicle Activities

Four long-toed salamander breeding sites were impacted by ATV use along roadsides or on back roads. Two sites in Goat Creek (site 12 and 16), one site along the road to Beaver Lake (site 57) and a site near Castle Falls (site 59) were frequently driven through by ATVs. Three of the ponds had long-toed salamander eggs in them. The site by Beaver Lake (Site 57) had over 400 long-toed salamander eggs as well as western toad egg masses in May. When the site was revisited later that spring there were ATV tracks through and around the pond. A thorough survey of the pond found no eggs in places where they had been during the first survey. It appears the eggs were destroyed or completely covered over with silt. The two sites in Goat Creek contained long-toed salamander eggs in a pool on the road but ATVs drove through the water bodies and destroyed the eggs. The Castle Falls site, which had long-toed salamander eggs in 1995 but not 2001, was full of ruts from ATV traffic. There was very little water in the puddle, so it may not have been an adequate site for breeding purposes this year, but in future wet years it may be susceptible to ATV destruction of breeding habitat. In contrast, recreational and industrial activities could create artificial breeding depressions (ruts from skidders, ATV's), which could be used by amphibians (DeMaynadier and Hunter 1995). However, the reproductive success of amphibian use of these man-made sites has not been investigated. They may act as population sinks if the environmental conditions do not exist to complete various aquatic live stages of the amphibian.

7.0 Recommendations

There are several management strategies recommended:

- Since there can be significant year to year variation in amphibian breeding population size long – term monitoring is necessary to determine population trends and size (Pechmann et al. 1991, Van Horne 1983, Graham and Powell 1999). It is recommended that the 2001 Columbian amphibian survey be repeated in five years, with verification of reports of additional sites in the interim period.

- To determine the status and trends of amphibian populations in southwestern Alberta a long-term monitoring site should be established. Several sites investigated in 2001 may be suitable for a Researching Amphibian Numbers in Alberta (RANA) project. Sites which are easily accessible for researchers and public education purposes should receive highest priority. One particular site, part of the Castle Wetlands, is recommended for RANA monitoring. This site supports populations of long-toed salamander, Columbia spotted frog and western toad, is near a major access road, and is adjacent to a cabin owned by the University of Lethbridge Biological Sciences Department.

- Development activities should be designed to minimize practices that impact or degrade terrestrial habitat near breeding sites (Semlitsch 2000). If timber harvesting or recreational activities are to occur adjacent to aquatic and terrestrial amphibian habitat, buffers should be maintained to reduce impacts such as loss of habitat, sedimentation, compaction of soil, and removal of coarse woody debris (de Maynadier and Hunter 1995). Semlitsch (1998) recommends a buffer of at least 165m from the edge of the wetland and up to 100m for a stream (DeMaynadier and Hunter 1995). Joslin and Youmans (1999) recommend that new recreational facilities, oil and gas developments, and road and trail projects should not be constructed within 300m of important wetlands. Buffers, presence of a variety of sizes and decay of coarse woody debris, retaining a thick litter layer and scattered patches of live and dead trees, will benefit amphibian populations.

- Practices such as herbicide use along roads for weed control and pesticide use to control insects near permanent and temporary ponds should not occur. Montana researchers recommend herbicide and pesticide should be brands that rapidly decompose and not be sprayed within 300 meters of waterbodies or wetlands (Joslin and Youmans. 1999).

- Logging activities in areas occupied by long – toed salamanders should be scheduled to occur during the winter (Graham 1997). This would minimize soil compaction and litter layer disturbance benefiting both amphibians and small mammals. Scarification should also occur during the winter months while salamanders are still underground.

- The Beaver Lake roadside pond (site 57) is also a mineral lick and water source used by a variety of wildlife. Elk, moose, deer and bobcat tracks were observed in the mud along the pond edge. Identifying for the public the importance of this site with a sign may help to protect the site. A partial fence on the north and south sides, restricting vehicle access through the ditch where an established off road trail exits may also help. The same could be done at the Castle Falls site. Goat Creek site disturbances would be difficult to correct, as they are right in the middle of the road. A possible mitigation would be to construct a 2m X 4m X 25cm deep pond in a moist area adjacent to the road in the protective cover of the forest. Amphibians may be attracted to the artificial pond and not use the road puddle.

- Research on recruitment and survival of long-toed salamanders in fish-bearing vs. non-fish-bearing ponds should be carried out in order to develop management recommendations to guide future fish and amphibian management decisions.

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